JUL 7 - 1936

AGRICULTURAL NEWS LETTER

VOL. 4 - NO. 7 JULY 1936

THIS PUBLICATION GIVES INFORMATION on new developments of interest to agriculture based on the work done by scientists and agricultural field men of the du Pont Company and its subsidiary companies.

It also gives reports of results obtained with products developed by these companies in the field whether the tests are made by field men of the companies, by agricultural experiment stations or other bodies. Also data on certain work done by agricultural stations on their own account and other matters of interest in the agricultural field.

This issue contains:

An Improved Fertilizer Ammoniating Solution with A Greater Proportion of Fixed Nitrogen

Control of Diseases of Small Grains in Iowa Sought in Experiments with Seed Treatments

Thiuram Sulfides as Repellents to Leaf-Eating Insects Prevents Feeding by Japanese Beetle and Certain Others

Cellulose Sponge Made from Wood and Cotton Pulps Is Superior to Natural Sponge for Laboratory Use

How Governmental and Other Agencies Cooperate to Promote Efficiency and Economy in Farming

Issued by
Publicity Department,
E. I. du Pont de Nemours & Co.,
Wilmington, Del.

Printed in U.S.A.

AN IMPROVED FERTILIZER AMMONIATING SOLUTION WITH A GREATER PROPORTION OF FIXED NITROGEN

EDITOR'S NOTE:- The development described here by Dr. Parker marks an important advance to the credit of the American chemical industry. Manufacturers of fertilizers and users alike will benefit from this significant achievement.

By F. W. Parker, Agronomist,
Ammonia Department,
E. I. du Pont de Nemours & Co.

During the last four years the fertilizer industry has utilized large quantities of Urea-Ammonia Liquor (UAL-A) as a source of nitrogen for mixed fertilizers. Since the introduction of UAL-A the demand for urea in fertilizers has decidedly increased. The increased demand doubtless results from a recognition of the importance of having a leaching resistant source of nitrogen of low equivalent acidity in mixed fertilizers. The expansion of facilities for urea production including the production of Crystal Urea has made possible the meeting of that demand by the production of an improved fertilizer material to be known as Urea-Ammonia Liquor-B (UAL-B).

UAL-B differs from UAL-A principally in having a higher content of urea and a proportionately lower content of free ammonia. The nitrogen content of the two liquors are given in the following table:

	UAL-B		UAL-A	
	Nitrogen %	Ammonia Equivalent %	Nitrogen %	Ammonia Equivalent %
Inorganic as free ammonia	25.2	30.6	30.4	36.8
Organic as Urea	20.1	24.4	15.1	18.4
Total	45.3	55.0	45.5	55.2
Ratio of inorganic to organic nitrogen	1 to 0.8		1 to 0.5	

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The higher proportion of fixed (urea) nitrogen in UAL-B enables a manufacturer to add 60 per cent more urea and 20 per cent more total nitrogen to a fertilizer than could be secured from UAL-A. Many manufacturers have derived 40 pounds of nitrogen from UAL-A in making a complete fertilizer. With the new liquor they can derive 48 pounds of nitrogen from the solution. In the first case, the fertilizer would contain 13.2 pounds of nitrogen from urea and in the second case 20.1 pounds of nitrogen would be in the form of urea.

UAL-B is shipped in insulated tank cars having a capacity of approximately 45 tons of liquor. The manufacturer handles the liquor through simple and inexpensive equipment and adds it to superphosphate or mixtures containing superphosphate. The inorganic ammonia reacts with the superphosphate forming ammonium sulfate and ammonium phosphate, the urea is dispersed as microscopic crystals intimately mixed with the fertilizer. There is considerable evidence to indicate that a large portion of the urea may be chemically combined with the calcium sulfate to form a relatively non-hygroscopic compound.

Better Fertilizers at Lower Cost

UAL-B is considered another step in the chemical industry's effort to provide the farmer with highly efficient nitrogen at low cost. It contains 45.3 per cent nitrogen and the savings incident to its high analysis are being passed on to the farmer as high grade fertilizers are purchased. The fact that all of the nitrogen in UAL-B is of low equivalent acidity makes it particularly useful in the manufacture of non-acid forming fertilizers. Furthermore, since all of the nitrogen in the fertilizer is resistant to leaching, it is admirably suited for use in the mixed fertilizers that are used under conditions where loss by leaching may be serious.

* * * *

The properties and use of UAL-B in the manufacture of fertilizers are fully described in a booklet "Urea-Ammonia Liquor-B" which may be secured on request from the Ammonia Department, E. I. Du Pont de Nemours & Company, Du Pont Building, Wilmington, Delaware.

CONTROL OF DISEASES OF SMALL GRAINS IN IOWA SOUGHT IN EXPERIMENTS WITH SEED TREATMENTS

EDITOR'S NOTE:- A valuable contribution to a better understanding of seed treatments is made by Extension Circular 226, June, 1936, titled "Small Grain Diseases in Iowa and Their Control" by R. H. Porter and D. V. Layton, Iowa State College Extension Service, R. K. Bliss, Director, Ames, Iowa. A summary follows.

The cost of producing small grains in Iowa is increased by a group of parasitic diseases, the most important of which are stripe and root rot of barley and smuts, rusts, blights, and ergot of barley, wheat, oats and rye. These diseases increase production costs by reducing the yield, quality and feeding value of the grain. Each of the above diseases is caused by a microscopic organism, but each organism is affected in its attack by such environmental factors as temperature, moisture and the condition of the host plants; hence the prevalence of, and losses caused by diseases vary from year to year.

It is the purpose of this circular to describe and illustrate those small grain diseases caused by parasites, which are partially or entirely seed-borne and, in so far as possible, prescribe methods of control. Inasmuch as rusts are not transmitted by seed and have been described separately in other station and extension publications, they will not be treated in this circular.

BARLEY DISEASES

Scab--Scab is undoubtedly one of the most important factors in the production of barley because it not only reduces the yield but renders infected grain inferior for either feed or malting.

Control of barley scab--No methods are known which will insure a crop of barley free from scab. This situation is largely due to the wide distribution of the scab parasite and to the uncertainty of environmental conditions. There are certain methods, however, which are known to afford a considerable measure of control. They are as follows:

1. Use clean seed whenever possible. A test by the seed laboratory at Iowa State College will tell how much scab is present.
2. Fan all seed thoroughly to remove the light weight kernels. These are commonly diseased.
3. Treat the seed before planting with a chemical dust which will prevent seedling blight (see seed treatment).

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4. Sow barley as early in the spring as possible to reduce seedling blights, hasten maturity of the crop and thus avoid serious scab injury.
5. Practice crop rotation so that barley will not follow crops heavily infested with the scab parasite. Avoid cornstalk land if possible, but if it is necessary to follow corn with barley, either remove the stalks, or plow them under before seeding barley. Barley does well after sugar beets, potatoes, or oats if the soil is fertile. Fertile soil which has grown soy beans should be satisfactory for barley. In many cases barley does well on clover sod. Drilling on plowed land is preferable to broadcasting. Rolling after sowing, when the soil is dry increases germination.

Helminthosporium Blight, Spot Blotch or Root Rot--The organism which causes blight is undoubtedly as widespread as the scab organism. It is similar to scab in that it attacks the seed, seedling, roots and heads.

Control of blight--The most effective control measures are: (1) Secure seed as free from disease as possible, (2) treat the seed with an organic mercury dust (3) plant the crop early, and (4) practice rotation as described for scab control.

Covered Smut--The presence of covered smut may be detected in threshed grain by the smut balls or by a laboratory test in the Iowa State College Seed Laboratory. Seed treatment with New Improved Ceresan, 1/2-ounce per bushel, will control covered smut.

Stripe Disease--Stripe of barley is more like a blight disease. It appears as long, yellowish brown stripes on the leaves and stems of infected plants which produce either badly shriveled heads or no grain at all. Stripe may be controlled by treating the seed with New Improved Ceresan, 1/2-ounce per bushel.

Bacterial Blight--Bacterial blight causes considerable loss in certain seasons. The most effective control measures are (1) to secure disease-free seed, and (2) to practice crop rotation.

DISEASES OF OATS

Oats Smuts--Oat smuts may be controlled by seed treatment using either formaldehyde or dusts.

Halo-blight--The cause of halo-blight is a bacterial organism which is carried by the seed but no practical seed treatment has been found that will completely control the disease.

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Seedling Blights--Either the scab or the blight organism may thus reduce the stand and the yield when carried by seed oats. Tests in the Iowa State College Seed Laboratory show that germination may be improved and the yield increased by treating infected lots of oats with New Improved Ceresan which controls or reduces the action of these organisms. It is not uncommon to have the stand increased by 5 to 15 percent from seed treatment.

DISEASES OF WHEAT

Scab--Symptoms of scab on wheat are similar to those on barley, but they are more readily detected on the former crop. The seed, seedling and head are the parts infected.

No control measures are known which are capable of controlling scab. The methods described for barley should be followed, especially fanning and seed treatment.

Stinking Smut--The smut spores are carried to the soil with seed wheat and germinate with the wheat kernel. Any disinfectant which will kill the smut spores without injury to the wheat kernels provides an effective remedy.

Locse Smut--Seed treatment with hot water is the only known method of control for loose smut.

DISEASES OF RYE

Stem smut attacks the heads and stems of rye, causing broken stems and heads with no grain. Control is readily accomplished by seed treatment with copper carbonate.

SEED TREATMENTS

Before any small grain is treated for diseases, it should be thoroughly fanned to remove weed seeds, smut balls and other diseased kernels. The following material may be used for the control of certain seed-borne diseases.

New Improved Ceresan--This is a new product for seed treatment. It contains a different mercury compound than the old Ceresan and since the percentage of active mercury is higher than in the old, much less dust is required for bushel.

New Improved Ceresan has been tried experimentally by the Botany and Plant Pathology Section of the Iowa Agricultural Experiment Station for 3 years on small seed lots. The seed laboratory has used this dust extensively on oats, barley, and flax in the laboratory and in the field. The extension plant pathologists have used it 3 years on oats, barley and flax on a field basis. It

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apparently is satisfactory to use on barley for the control of covered smut, stripe and seedling blights, on oats for seedling blight and smut control and on wheat for control of stinking smut and seedling blights. The cost of the new dust, if purchased in quantity, is less than 2 cents per bushel.

In the above test the treated samples gave an average yield of 22.9 bushels per acre and the untreated 20.9 bushels, showing a gain of 2 bushels per acre. The percentage gain in yield was 9.3 for the entire plot due to seed treatment. The highest increase on any sample was 5.3 bushels when the yield of the untreated sample was 20.5 bushels per acre. On 2 lots out of the 20, no increase was secured. The yields per acre were low because of the drouth.

(Other materials for treating seed discussed include copper carbonate, Copper Carb, formaldehyde, and modified hot water. -- Editor)

WHEN AND HOW TO TREAT SEED

If New Improved Ceresan or other mercury dusts are used on oats and barley, the treatment should be made at least 2 days before the grain is sown, but the grain may be treated several weeks before seeding if kept in a dry bin.

"Ceresan" is a trade mark registered in the U. S. Patent Office by the Bayer-Semesan Company, Wilmington, Delaware.

THIURAM SULFIDES AS REPELLENTS TO LEAF-EATING INSECTS PREVENTS FEEDING BY JAPANESE BEETLE AND CERTAIN OTHERS

EDITOR'S NOTE:-The importance of the brief statement that follows will at once be realized by entomologists and others engaged in pest control. It appeared as a note in the Journal of Economic Entomology, Vol. 29, No. 2, April, 1936, p. 467.

By H. G. Guy,
Delaware Agricultural
Experiment Station,
Newark, Delaware.

In laboratory tests with organic compounds it has been found that the thiuram sulfides repel several leaf-feeding insects. They apparently prefer to die of starvation rather than to feed upon foliage coated with a thiuram sulfide spray. Investigations with these compounds have been continued since July 1933, when they were suggested by Dr. W. H. Tisdale of the Grasselli Chemical Co., who in 1931 had noted the repellent affect of tetra methyl thiuram monosulfide to the eastern tent caterpillar. The following insects have been prevented from feeding upon their host plants by thiuram sulfides in dusts and sprays: Colorado potato beetle (potato), Mexican bean beetle (bean), eastern tent caterpillar (wild cherry), and Japanese beetle (smartweed). The most effective compound in this group discovered to date is tetra methyl thiuram disulfide.

CELLULOSE SPONGE MADE FROM WOOD AND COTTON PULPS IS SUPERIOR TO NATURAL SPONGE FOR LABORATORY USE

EDITOR'S NOTE:- The development of the cellulose sponge is another example of the ability of the research chemist to improve on Nature in providing things for man's use. It also tends to confirm the expectation of a wider use of produce of the soil in industrial chemical products.

A cellulose sponge, peculiarly adapted to use in chemical, biological and other laboratories, is now available. It is made of cellulose obtained from highly purified wood and cotton pulps. Incidentally, it is to be noted that the manufacture of this sponge opens a new outlet for produce of the soil as raw materials for chemical products.

The sponge-like construction is obtained through chemical reactions. During manufacturing processes, the sponge material is refined and thoroughly sterilized, washed and dried. The sponge is the first of its kind to be made in this country although a similar product originated in Europe several years ago.

Advantages of the "synthetic sponge" over natural sponge for laboratory use include its greater durability, resistance to dilute acids and organic solvents, and extremely great resistance to alkalies. It may be thoroughly sterilized by boiling in water or by the use of steam.

Shape and Structure Offer Advantages

The sponge is shaped like a brick and is available in four standard sizes, ranging from 4 5/8" x 3 1/8" x 1 1/4" to 6 1/2" x 4 5/8" x 2 1/2". It has medium to coarse pores and is a light beige or straw color. It swells slightly when wet and becomes extremely soft and pliable. The largest size will absorb 2 1/2 pints of water which is 95 per cent its own cubical content or roughly 25 times its own weight. It floats in water.

Its shape fits it to the hand, whereas natural sponge, owing to its irregular shape, is not entirely satisfactory for use.

It has a large wiping surface and is a reservoir for an unusually large quantity of liquid, which it holds better than does sea sponge. This capacity is due not alone to the interconnected pores, but also the unusual capillary attraction of the sponge material for liquids.

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Users may cut the sponge into any desired shape or size to meet any requirement without destroying its uniform "spongy" texture.

Useful for Special and General Purposes

Although the cellulose sponge is ideally suited to laboratory purposes, it is by no means limited in its uses. It offers decided advantages for use in creameries, on dairy farms and elsewhere, and in veterinary work because of the ease with which it can be sterilized.

Naturally, a sponge that possesses all the valuable properties of the natural product can be used for any purpose for which a sponge is required.

Note:- The cellulose sponge is manufactured by the Cellulose Sponge Division of the Du Pont Cellophane Company, 350 Fifth Avenue, New York, N. Y.

HOW GOVERNMENTAL AND OTHER AGENCIES COOPERATE TO PROMOTE EFFICIENCY AND ECONOMY IN FARMING

EDITOR'S NOTE:-Instead of the usual contribution on agricultural uses of explosives, there is presented here an excerpt from a paper read at the Second Dearborn Conference of Agriculture, Industry and Science, Detroit, Michigan, May 12, 13 and 14. This paper was prepared by L. F. Livingston, manager, Agricultural Extension Section, E. I. du Pont de Nemours & Company.

(The following is from the portion of Mr. Livingston's paper that discussed the educational and other aid given the farmer by various agencies.)

At the top is the United States Department of Agriculture. This is one of the most important departments of the government. Fifteen general officers and seventeen bureau chiefs at an average salary of $7600 per year are needed to administer its complex activities. This is more than the Departments of Commerce and Labor have combined. The Federal Department of Agriculture has available for distribution, free or at cost of printing, authoritative bulletins on every conceivable phase of farming. Its experts are constantly exploring the world for new things, while it cooperates with state operated Experiment Stations in every state for studies of specific local problems. This vast service organization stands at the command of the humblest farmer.

Examples of the Service Rendered

It is pertinent to consider briefly the highly personalized sort of assistance given farmers by just one agency of the Department--the Bureau of Agricultural Engineering. Quoting at random from the latest annual report of the Bureau, one finds that during the year nearly 17,000 farmers were aided in procuring better types of machines and using equipment more efficiently. Over 18,000 were trained in adjustment and repair work on nearly 30,000 machines; 31,000 were given expert help in planning 36,000 new buildings, and on 24,000 farms in improving or remodeling old buildings originally designed for the needs of animal power days and poorly adapted to modern purposes.

Along with a variety of major research projects ranging from soil erosion control to the development of seed treating and pest control equipment, the Bureau made intimate studies of individual farms over seven states. Among 108 farms of the better type it

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failed to find one that could not reduce its costs by making changes within the owner's means. In other words, in this single, relatively small agency of government has been accumulated enough hard facts on farm betterment, which, if they could be made generally applicable, would substantially narrow the gap between agricultural depression and prosperity for some millions of farm owners.

A Network of Service Agencies

Second in order to the Federal agencies we have the State agricultural agencies, the agricultural colleges and experiment stations, and a national network of demonstration and experimental farms. Third in line we have the County Agents, who are within telephone or post card call of every farmer. From one or another of these publicly maintained sources the farmer can, theoretically at will and usually at no cost, obtain the best advice that is to be had on any subject he may name, from planning a 1,000-acre crop program to ridding his hens of lice. No other industry under the sun, no other occupation, no other individual worker has such an abundance of expert aid at his call.

Additional to these public agencies are the farm cooperatives, a farm press that blankets every district, and the agricultural agents of corporations, such as the railroads and manufacturers of farm materials, or of manufacturers who buy farm products for raw materials. Summed up thus, it seems that a farmer must be indeed indifferent to avoid being educated in his calling.

We have established an elaborate and costly system to help the farmer who knows least, but in practice its services are utilized chiefly by the farmer who knows most, that is, by the 35 per cent who are already successful and who wish to continue so.

Perhaps we need better salesmen in the agricultural services. Perhaps these services, comprehensive though they appear, are insufficiently manned. Personally, I know County Agents who are attempting to do work that should occupy a half dozen men full time. Perhaps, instead of paying farmers to adopt progressive methods, as a child might be bribed to wash behind his ears and clean his teeth, it would be better economy if we spent that money to establish progressive methods on their merits by doubling or even trebling educational facilities. Surely the benefits would be more lasting.

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